Intro, Monitoring goals & objectives, Conceptual Models, and Vital Signs

Also use main handout of review materials (http://www.nature.nps.gov/im/units/pacn/monitoring/plan/vs04/review_materials.htm)

Ecological Characteristic	Vital Sign Category			Monitoring Objectives
Human activities & cultural practices	Soundscapes			Monitor sound sources, frequencies, occurrence, and levels
	Viewscapes / Lightscapes			Monitor landscape / seascape appearance
				Monitor light levels and characteristics of light/dark cycles
	Land Use			Monitor points of entry for invasive species
				Monitor water use adjacent to or upstream from park boundaries
				Monitor land use adjacent to, or upstream of, park boundaries
	Park Use & Activities			Monitor debris-trash occurrence in coastal, riparian, wetland, and lacustrine habitats; in or near high use areas
				Monitor patterns of park visitation, use & damage (terrestrial & marine)
				Monitor incidence & occurrence of bioprospecting
				Monitor levels of take & harvest of harvested species (marine, freshwater, and terrestrial) or resources (coral, sand)
	Management Zones			Monitor patterns and effects of use and management
				Monitor effects of management practices on wilderness character
Physical / Chemical Environment	Climate & Air Quality			Monitor visibility
				Track rates of atmospheric deposition
				Track atmospheric concentrations of particulates and gases, levels of radiation--emphasizing those with known human health or environmental impacts
				Monitor core weather/climate conditions within each park (on each island)
				Monitor frequency and intensity (severity) of extreme events (hurricanes, waves, winds, rain, etc.)
				Identify and monitor spatial patterns of climate, such as trade-wind inversion elevation, lifting condensation level, lapse rates, etc.
	Soil, Water, & Nutrient Dynamics			Monitor physical ocean dynamics--ocean currents, sea level, tides/swell
				Monitor cycles of nutrients and elements within soils and water--including carbonate (oceanic), nitrogen, and phosphorous
				Monitor soil erosion
				Monitor soil quality trends (physical, toxics/contaminants, other biologic and nutrients)
				Monitor condition and extent of soil crusts
				Monitor trends in surface water flow regimes
				Monitor wetland (incl. anchialine ponds) water flow exchange dynamics, size, and distribution
				Monitor ground water flow rates and direction of movement (recharge)
	Water Quality			Monitor water quality core parameters
				Monitor supplemental water quality parameters
				Monitor microbiological water quality parameters
				Monitor toxic and contaminant levels in water
				Monitor biological invertebrate communities
	Geology	Hazards		Monitor surface volcanic activity (lava flows, eruption events & ground deformation)
				Monitor volcanic & non-volcanic seismicity
				Monitor extent, location, and causes of mass wasting events (e.g. landslides)
		Landforms		Monitor shoreline dynamics
				Track dune locations and topography
				Identify and monitor the extent of permafrost
				Monitor karst and non-karst cave and lava tube habitat characteristics, topography, and extent
Biotic Integrity	Terrestrial Ecosystems	Vegetation	Landscape	Monitor patterns of distribution & extent of community types
				Monitor fire regimes and effect on vegetation
				Track insect and disease presence during forest dieback
			Community	Monitor community dynamics, structure, function, and composition
				Monitor effects of management on native communities
			Population	Monitor effects of biocontrol on native and invasive species
				Monitor population size and distribution of native, endemic, or focal species, including response to restoration efforts. Where appropriate, measure demographics (size/age structure, reproduction, recruitment, etc.) of selected indicator species
				Monitor disease incidence and impacts, especially on native species
				Monitor extent and response to treatment of established invasive species
				Monitor occurrence of non-established (incipient) invasive species
		Consumers	Community	Monitor community dynamics, structure, function, and composition
				Monitor effects of management on native communities
			Population	Monitor effects of biocontrol on native and invasive species
				Monitor population size and distribution of native, endemic, or focal species, including response to restoration efforts. Where appropriate, measure demographics (size/age structure, reproduction, recruitment, etc.) of selected indicator species
				Monitor disease incidence and impacts, especially on native species
				Monitor extent and response to treatment of established invasive species
				Monitor occurrence of non-established (incipient) invasive species
		Cave Systems	Community	Monitor changes in cave communities
	Freshwater Ecosystems	Producers		Monitor community composition, structure, and productivity
		Consumers	Community	Monitor community dynamics, structure, function, and composition
			Population	Monitor disease incidence and impacts, especially on native species
				Monitor population size and distribution of native, endemic, or focal species, including response to restoration efforts. Where appropriate, measure demographics (size/age structure, reproduction, recruitment, etc.) of selected indicator species
				Monitor extent and response to treatment of established invasive species
				Monitor occurrence of non-established (incipient) invasive species
	Marine Ecosystems	Benthic	Landscape	Monitor patterns of distribution & extent of community types
			Community	Monitor community dynamics, structure, function, and composition
			Population	Track community and population trends in harvested fisheries / collected species
				Monitor population size and distribution of native, endemic, or focal species, including response to restoration efforts. Where appropriate, measure demographics (size/age structure, reproduction, recruitment, etc.) of selected indicator species
				Monitor disease incidence and impacts, especially on native species
				Monitor extent and response to treatment of established invasive species
				Monitor occurrence of non-established (incipient) invasive species
		Water column (motile)	Community	Monitor community dynamics, structure, function, and composition
			Population	Track community and population trends in harvested fisheries species
				Monitor disease incidence and impacts, especially on native species
				Monitor extent and response to treatment of established invasive species
				Monitor population size and distribution of native, endemic, or focal species, including response to restoration efforts. Where appropriate, measure demographics (size/age structure, reproduction, recruitment, etc.) of selected indicator species
				Monitor occurrence of non-established (incipient) invasive species
		Intertidal	Community	Monitor community dynamics, structure, function, and composition
			Population	Track community and population trends in harvested fisheries collected species
				Monitor population size and distribution of native, endemic, or focal species, including response to restoration efforts. Where appropriate, measure demographics (size/age structure, reproduction, recruitment, etc.) of selected indicator species
				Monitor extent and response to treatment of established invasive species
				Monitor occurrence of non-established (incipient) invasive species